In the present invention having the above structure, records of access to data stored in a plurality of optical discs in the past and records of exchanges of optical discs in the past can be managed. On the basis of these records, access frequencies in the future are estimated. Data items which are estimated to be accessed at a high frequency are stored into a high-speed device such as a hard disc or the like. Data items which are estimated to be accessed at a middle frequency are stored into a specified optical disc, and data items which are estimated to be accessed at a low frequency are stored into other optical discs. The specified disc storing the data items which are estimated to be accessed at a middle frequency is always attached into an optical disc drive.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate presently preferred embodiments of the invention, and together with the general description given above and the detailed description of the preferred embodiments given below, serve to explain the principles of the invention.

FIG. **1** is a block diagram showing the entire structure of an optical disc apparatus according to an embodiment of the present invention;

FIG. **2** is a block diagram showing the schematic flow of processing in the optical disc apparatus shown in FIG. **1**;

FIG. **3** is a chart which explains processing for estimating an access frequency in the future with respect to logic blocks;

FIG. **4** is a schematic view showing a garbage collection **1**;

FIG. **5** is a schematic view showing a garbage collection **2**;

FIG. **6** is an example of records of a structure management table;

FIG. **7** is an example of records of a structure management table for an optical disc used as a middle frequency storage;

FIG. **8** shows an example of records of a logic block management table;

FIG. **9** shows an example of records of a physical block management table;

FIG. **10** shows an example of records of a cash HDD block management table;

FIG. **11** shows an example of records of an optical disc management table;

FIG. **12** shows an example of records of an optical disc drive management table;

FIG. **13** is a flow-chart for explaining processing of an optical disc apparatus;

FIG. **14** is a flow-chart for explaining logic block read processing;

FIG. **15** is a flow-chart for explaining logic block stage out processing in the cash HDD;

FIG. **16** is a flow-chart for explaining write processing to an optical disc used as a middle frequency storage;

FIG. **17** is a flow-chart for explaining write processing to an optical disc used as a low frequency storage;

FIG. **18** is a flow-chart for explaining physical block read processing;

FIG. **19** is a flow-chart for explaining access record update processing;

FIG. **20** is a flow-chart for explaining frequency estimation processing;

FIG. **21** is another flow-chart for explaining frequency estimation processing;

FIG. **22** is a flow-chart for explaining logic block write processing;

FIG. **23** is a flow-chart for explaining operational management processing;

FIG. **24** is a flow-chart for explaining a garbage collection;

FIG. **25**A to **25**C are flow-charts for explaining a garbage collection **1**; and

FIG. **26**A to **26**C are flow-charts for explaining a garbage collection **2**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following, an embodiment of the present invention will be explained with reference to the drawings.

FIG. **1** shows a system configuration of an optical disc apparatus according to the present invention. This optical disc apparatus comprises a CPU **1**, a main memory **2**, an HDD **3**, a cache HDD **4**, an automatic changer **7**, an automatic changer control portion **5**, an optical disc drive control portion **6**, and a communication control portion **8**.

The HDD **3** and main memory **2** are used to store programs and data according to the present invention. The CPU **1** controls operations of the entire apparatus. Programs stored in the HDD **3** are stored into the main memory **2**, and respective components or portions of the apparatus are controlled in accordance with the contents of the programs thus stored in the memory **2**. The automatic changer **7** comprises a plurality of optical disc container cells **21***a* to **21***k*, a plurality of optical disc drives **22***a* to **22***d*, and an accessor **23**, and is controlled by the automatic changer control portion **5**.

Integral numbers of 0 to 10 are respectively designated to the container cells **21***a* to **21***k*, and optical discs **24** can be contained in ten container cells **21***b* to **21***k* which are respectively designated by numbers 1 to 10. The container cell **21***a* designated by the number 0 is used as a window for setting optical discs **24** into the automatic changer **7** or pulling them out from the changer.

The optical disc drives **22***a* to **22***d* are used to write data into optical discs **24** and read data therefrom. Four optical disc drives **22***a* to **22***d* are controlled by an optical disc drive control portion **6**. An accessor **23** serves to transfer optical discs **24** between the container cells **21***a* to **21***k* and the optical disc drives **22***a* to **22***d*. In FIG. **1**, optical discs of No. 10 and Nos. 1 to 3 are respectively set in the optical disc drives **22***a* to **22***d*, and container cells **21***k* and **21***b* to **21***d* respectively corresponding to the optical discs thus set in are empty as indicted by dashed lines.

The cache HDD is used to store data items which have been recently read from the optical disc drives **22***a* to **22***d*, and serves as a high-speed device for storing data items which are accessed most frequently. A cache memory con-